



Seebeck Effect And The Biomedical Mechanism Of Warm Needling

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Introduction



- Moxibustion was a common practicing modality in oriental medicine.
- Warm Needling (WN) is an effective acupuncture modality frequently used for pain relief, such as sciatica and osteoarthritis. It is the combination of needle acupuncture and moxibustion.

Warm Needling

- A practice performed by placing an ignited moxa stick on the handle of the needle after insertion.



**WHO international standard terminologies on traditional medicine in the western pacific region World Health Organization (2007)*





Possible Mechanism of Warm Needling

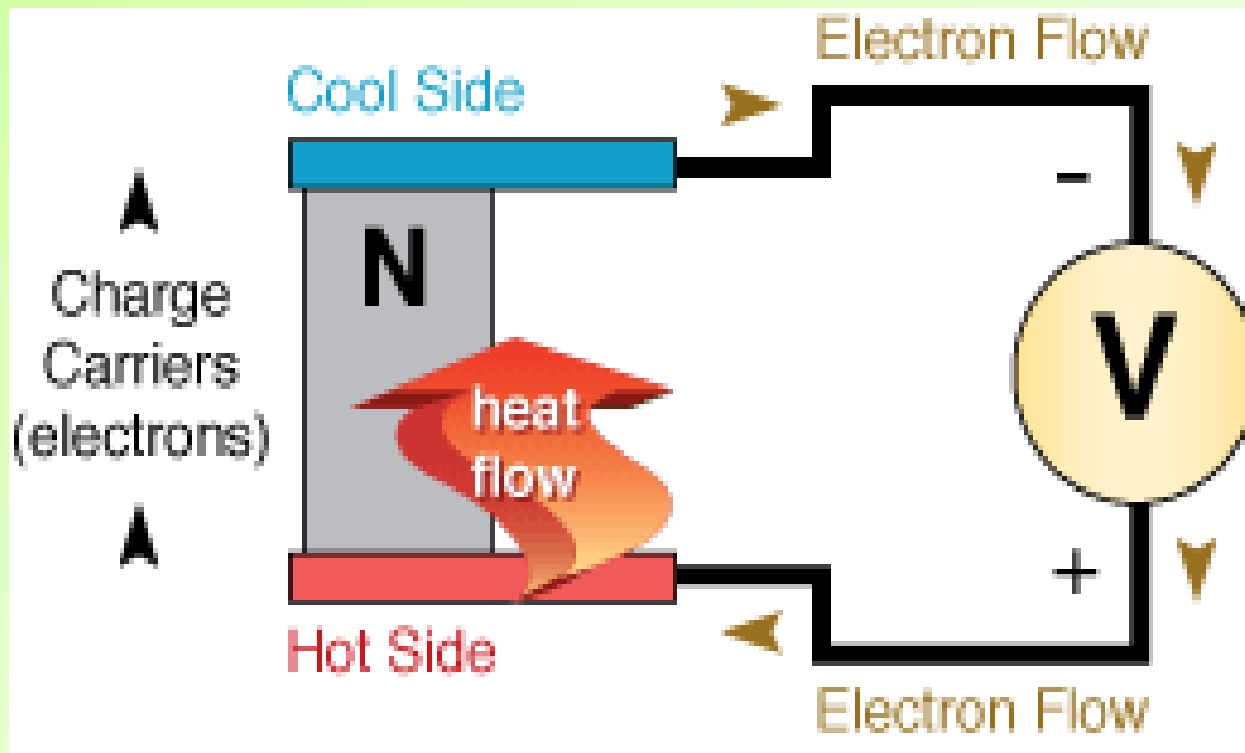
- Effects of Warmth radiation and transmission.
- Thermo-electric effect (Seebeck effect).

Seebeck effect



- The Seebeck effect is the conversion of temperature differences directly into electricity.
- A Estonian-German physicist, Thomas Johann Seebeck, discovered that in 1821. The Danish physicist Hans Christian Ørsted played a vital role in explaining and conceiving the term "thermoelectricity".







- There were very few studies to investigate the mechanism of the WN.



Objective

- This study tried to explore the biomedical mechanism of WN by measuring the temperature and electrical property of the needles.



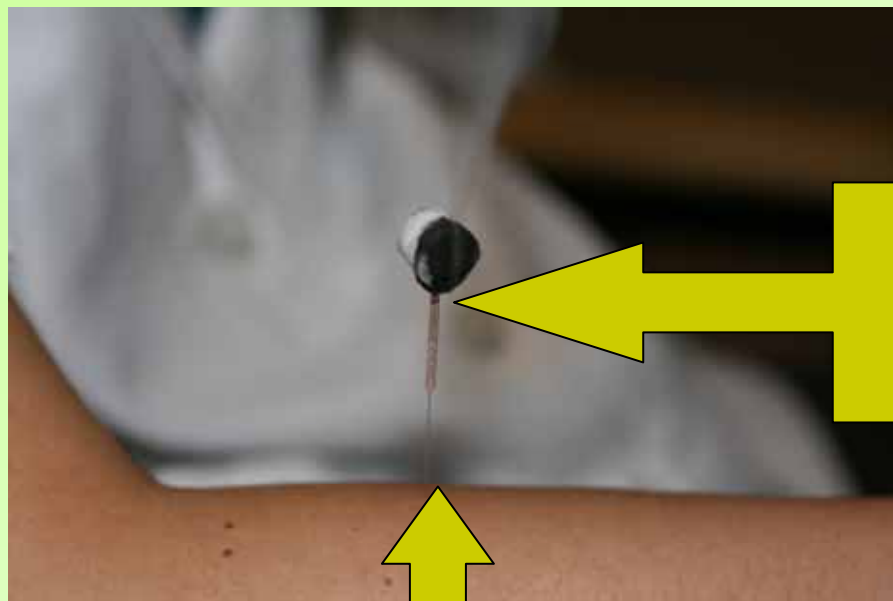
Methodology



- Eight 2-inch 30 gauge stainless acupuncture needles were selected.
- Eight moxas were weighted and applied to the needles.
- The room temperature was controlled at $25\pm 1^{\circ}\text{C}$.
- The handles of needles were close to the burning moxa, while the tips of needles were close to the skin.



Measuring spots



Handle part

Tip
Part



- The temperatures of handles and tips were measured through out moxa burning period using two thermometers.
- The electrical current between handles and tips were also measured with avometer.

Electronic thermometer and Avometer





- Microsoft Excel 2003 was used to perform statistical analysis.



Results



- The average weight of moxa was $1.32 \pm 0.1\text{g}$.
- The mean temperature of the handles and tips were $60.0 \pm 11.5^\circ\text{C}$ and $25.6 \pm 0.6^\circ\text{C}$ respectively.
- The measured current between handles and tips ranged from 0.01-0.11mA and the mean was $0.05 \pm 0.01\text{mA}$.



- The average of temperature differences between handles and tips was $84.7 \pm 17.7^{\circ}\text{C}$.
- The correlation coefficient of electrical current and temperature difference was 0.91.
- The temperatures of the tips did not elevate consistently.



Temperture of Warm Needling

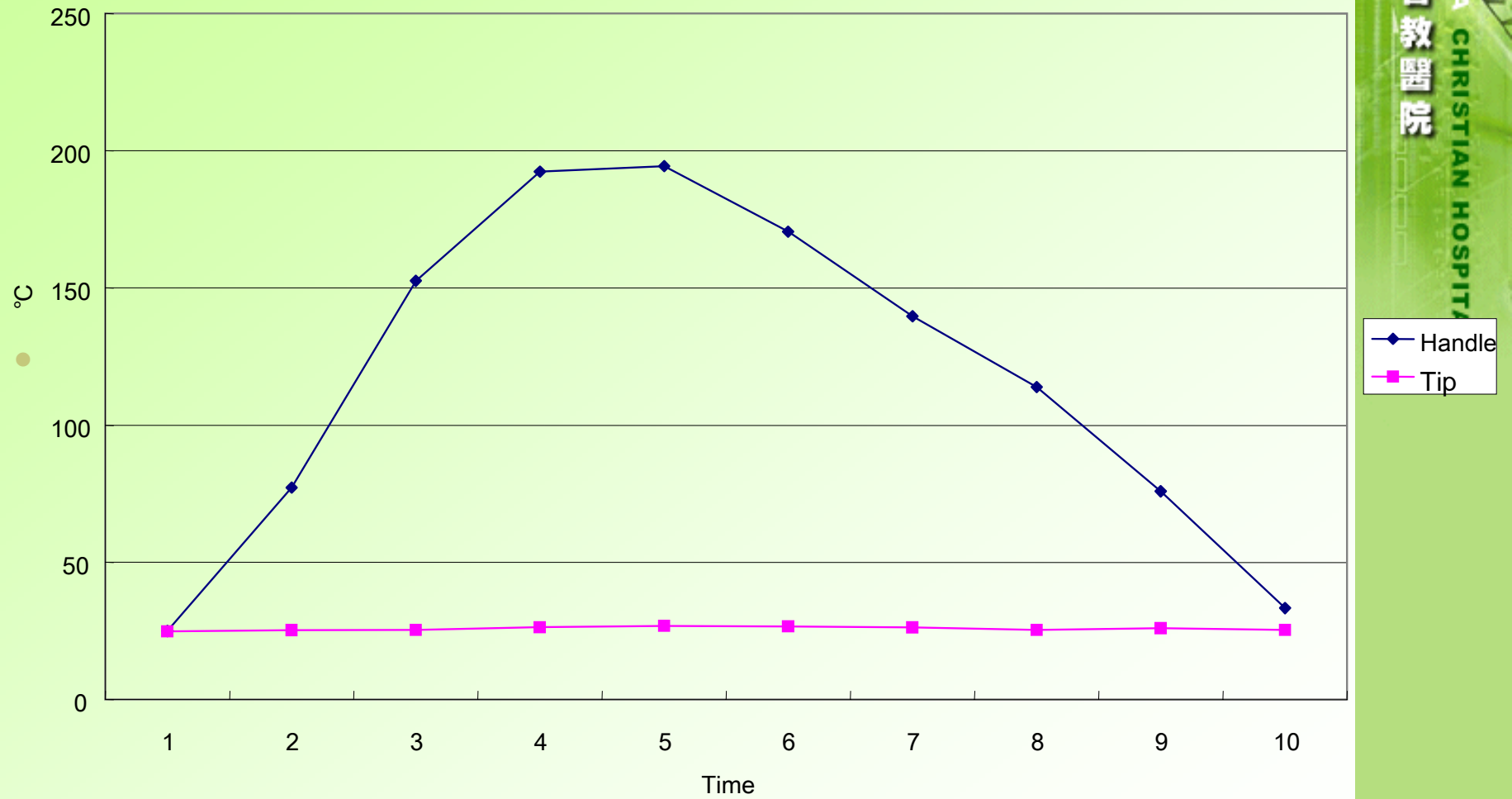
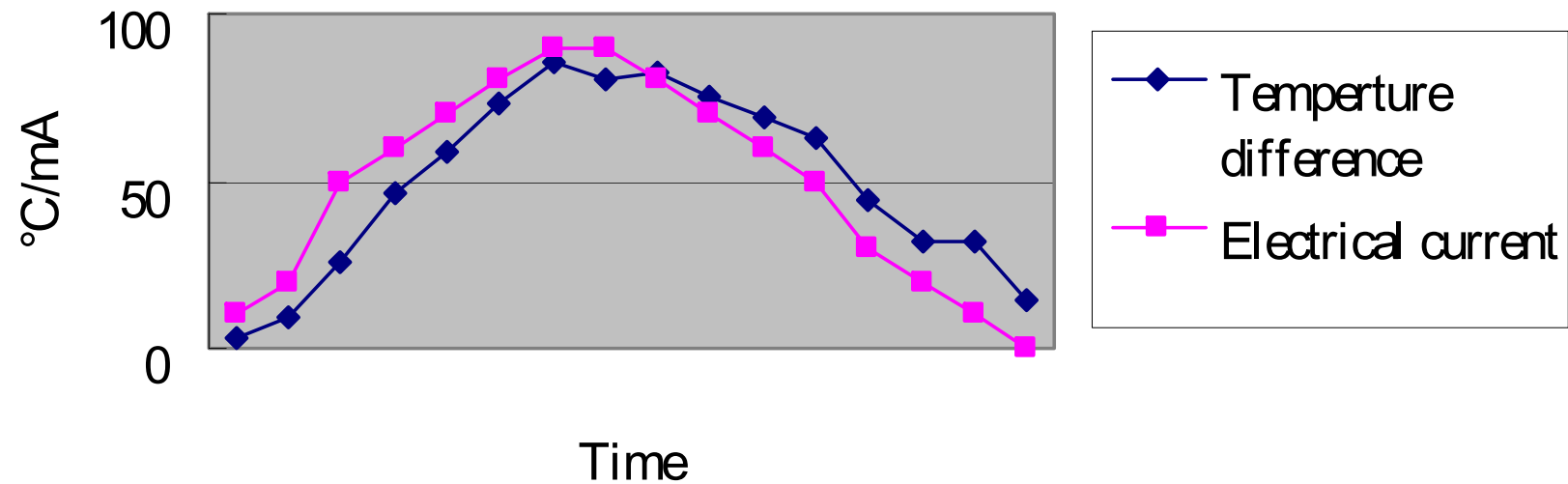




Fig. Distributions of Temperature difference and Electrical current



correlation coefficient = 0.91



Discussion

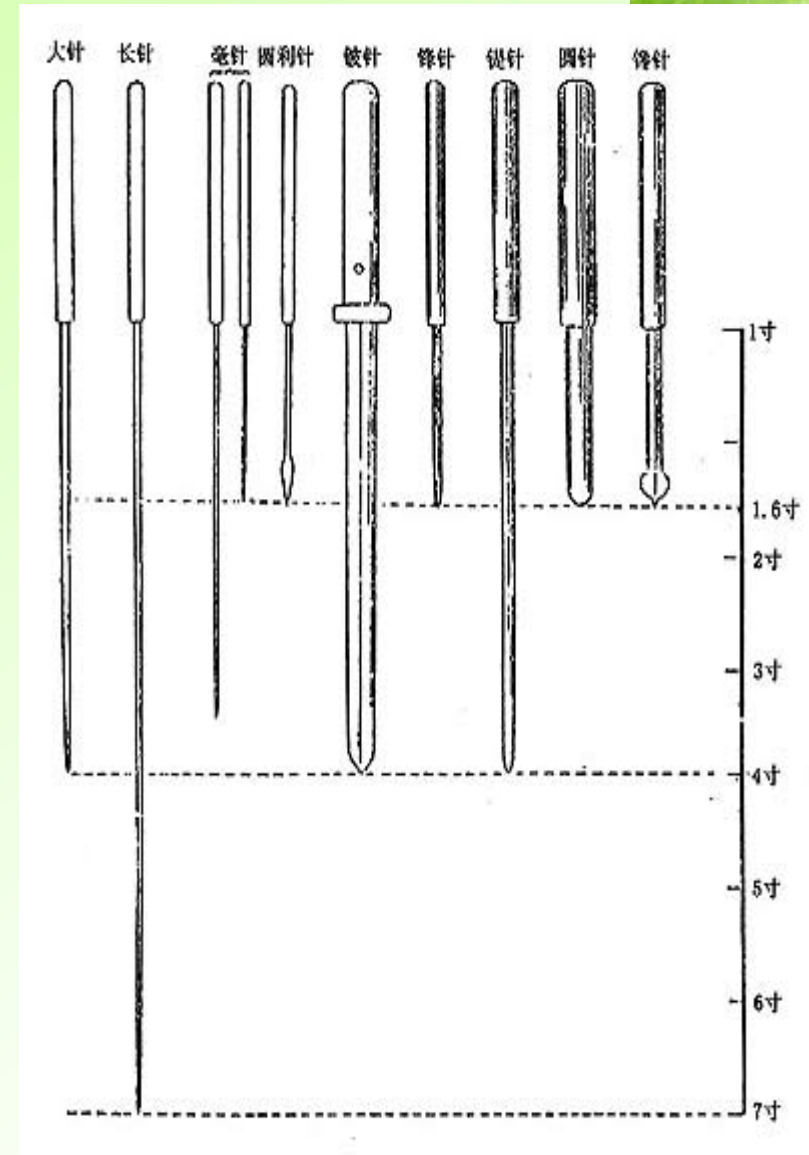


- The result showed persistent low temperature($25.6\pm 0.6^{\circ}\text{C}$) near tip. It indicated no strong heat was transmitting to the skin through the needle.
- Warmth transmission might not be the key mechanism for WN in this study.



- The traditional design of acupuncture needles and traditional needle manipulations seem to maintain a temperature gradient across the needle and thus enhance the Seebeck effect.

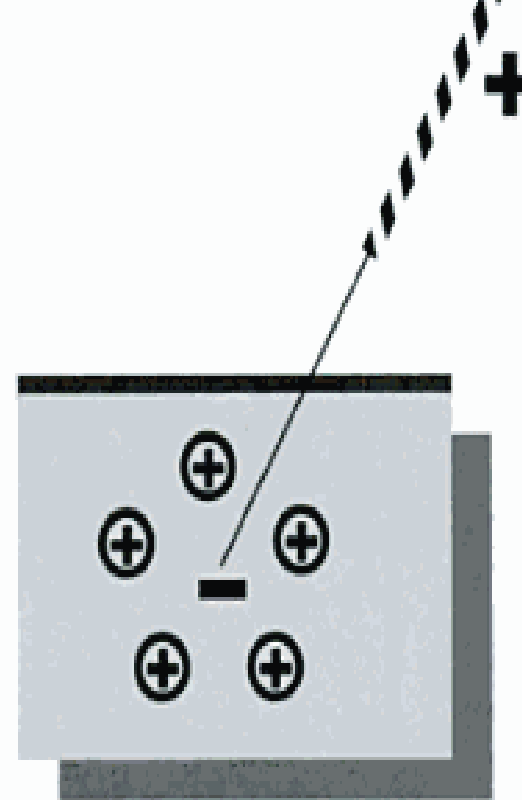
- Cohen M, Kwok G, Cosic I.: *Acupuncture needles and the Seebeck effect: do temperature gradients produce electrostimulation? Acupunct Electrother Res.* 1997;22(1):9-15.





- When the handle is heated or manipulated manually, the polarity of the needle-electrode changes to a negative tip inside the body, and it thereby attracts positive ions.
- Measurements along the heated or manually manipulated needle show a current of 10 to 15 micro-amperes.
- This corresponds to *tonifying technique* of needling.

TONIFICATION



-*Acupuncture energetics: A Clinical Approach for Physicians*
JM Helms 2007 pp. 76



- Electrical Acupuncture and WN both got good effects on pain. In our experience, WN had even better effect for chronic pain.
- A lower bio-generated current by Seebeck effect could be more adoptable for human body than pure electricity.



- This study is a simple and straight forward research, further work using high power electrical and temperature devices (such as infra-thermography) to measure the changes would be continuing.



Conclusion

- The study concluded Seebeck effect could be a major role in biomedical mechanism of Warm Needling.



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Thank you for your attention!